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TECHNICAL MANUAL

RESPIRATORY HUMIDIFIER MODEL

HC100

Revision F

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Technical Manual for HC100 Respiratory Humidifier.

Fisher & Paykel Healthcare have a policy of continued product improvement and reserve the right to alter specifications without notice

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Changes to technical manual since last version

Description of change	page
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Remove Appendix B Maintance Schedule	

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1.0 GENERAL INFORMATION

This section describes the application and specifications of the General Purpose HC100 humidifier. Refer to the HC100 operating manual for detailed operating instructions.

The release of this revision of the technical manual is to coincide with a variety of modifications to the HC100. Modifications include to removal of the stainless steel standoff on the heaterplate. These have been replaced by a long screw. The surface of the heaterplate has also been anodised.

1.1 APPLICATION

The HC100 is a general purpose respiratory humidifier designed to warm and moisten gases from positive pressure breathing systems.

1.2 HC100 ELECTRICAL SPECIFICATIONS

Supply Voltage:	230 ± 25 V 115 V 100 ± 10 V
Supply Frequency:	50 or 60 Hz
Supply Current:	0.4 A maximum at 230 V 0.8 A maximum at 115 V 0.9 A maximum at 100 V
Water Heater:	85 W

1.3 STANDARDS AND APPROVALS

Classification under UL1431, CAN/CSA-C22.2 No 125, IEC601-1, AS3200.1

Class 1

Type B

Drip Proof

Continuous Operation.

2.0 Circuit Operation

2.1 Temperature Control

(Component references are to the circuit diagrams in §4.6 and §4.7)

Operating power for the electronic circuits is provided by the network R15, R16, D3, and C1. A green LED (LED1) serves as a power-on indicator.

The precision temperature sensing thermistor (TH), in series with R8, forms one arm of a wheatstone bridge. The resistor network of R5, R7, R4, R6 and VR1 completes the bridge circuit. The bridge output is monitored through R10 by U1d, connected as a voltage comparator. The output of VR1 buffered by the follower stage, U1c, sets the switching level for the comparator and the remaining active circuit components. U1e, another comparator stage, provides a fast switching output to the gate of triac Q1 to control the heaterplate. LED2 indicates heaterplate switching on and off. Lastly, U1b acts as a shunt voltage regulator to maintain a relatively constant circuit operating voltage as the gate current to Q1 is switched on and off.

2.2 Overheat Protection

An overheat protector (93 ± 5 °C) is mounted on the heaterplate assembly. If there is an electronic component failure that may cause uncontrolled heating, the protector will open and disconnect all power to the heater base.

3.0 Performance Check

The performance check should be done after the HC100 has been serviced due to a fault. This procedure is to be used to check the operation of the HC100 heater base without dismantling the unit.

When stability has been obtained, the actual water temperature will depend slightly on the deviation of the chamber base and heaterplate from the ideal flat condition. The variation of the water temperature as the heaterplate switches on and off remains within ± 1 °C.

3.1 Performance Check Procedure

1 Fill an HC300 humidification chamber to the correct level with water and slide it onto the heaterplate.

2 Place a 300 mm alcohol-in-glass thermometer vertically through the outlet port of the chamber with the bulb resting on the chamber bottom.

3 Turn the heater control knob fully clockwise and turn on the power.

4 Allow 60 minutes for the water temperature to stabilise.

5 Read the thermometer. It should be within the range of 50 to 66 °C.

6 The temperature should continue to cycle within the calibration range of 50 to 66 °C

7 Check that 'power' and 'heat on' lights are operating.

3.2 Calibration

The HC100 humidifier is controlled by a precision thermistor and close tolerance electronic components and does not require any calibration.

The precise temperature and stability of the humidifier can be checked during the performance check procedure.

4.0 SERVICING INFORMATION

This section provides information for servicing the HC100 humidifier After any servicing involving opening of the humidifier case the performance check procedure in §3 should be carried out to confirm the operation of the control circuit. Note that no calibration is required.

4.1 PRINTED CIRCUIT BOARD REMOVAL

1 The HC100 case is opened by removing the 3 fixing screws from under the humidifier body.

2 The case top assembly can now be moved aside and the two wiring harness cable connectors disconnected from the circuit board.

3 Remove the AC power line cable from the terminal block on the circuit board.

4 If the two plastic retaining latches (just in front of the earth studs) are moved backwards slightly, the rear of the circuit board can be popped up allowing the board to be withdrawn away from the front panel.

***Important*:**

On reassembly with a new PCB, be sure to check that link LK1 has been cut (or removed) for the 220 to 240 V models

4.2 HEATERPLATE

The reset button for the 93 °C over temperature protector is accessible through a small hole under the heaterplate in the front panel case assembly. The heaterplate can be detached from the front case assembly by removing the three screws that secure it to the front case. On replacing the heaterplate, ensure that the three springs are in place by slotting them into the recesses for them on the heaterplate.

A tip to aid the replacement of the heaterplate is to place Ø2.2 mm drill blanks in each of the standoff screw holes. Then place the spring over them. Then use the drill blanks to guide the heaterplate and the upper case together.

4.3 ELECTRICAL SAFETY TESTS

After the HC100 has been serviced the following electrical safety tests should be performed or electrical safety tests in accordance with the relevant country regulations.

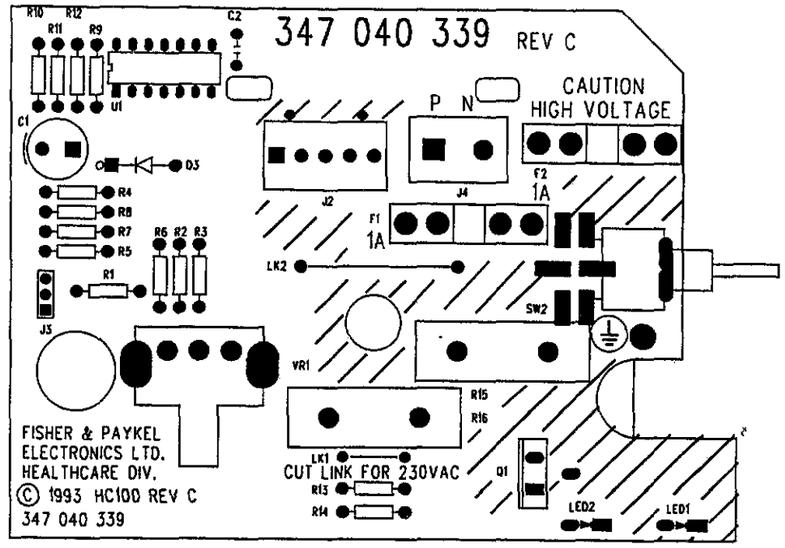
Test	Method
Earth Resistance	Use an ohmmeter and measure the resistance from the earth pin on the mains plug to the heaterplate. It should be ≤ 0.2 Ω. Check humidifier power cable for damage and replace if cut or worn.
Insulation Resistance	Use a 500 VDC insulation tester to measure the resistance from the phase pin on the mains plug to the heaterplate. It should be ≥ 10 MΩ
Earth Leakage	Measure earth leakage with the earth probe of the tester on the heaterplate . Earth leakage current is measured at normal operating voltage and frequency of power supply. It should be 0.5 mA maximum.

4.4 THERMISTOR

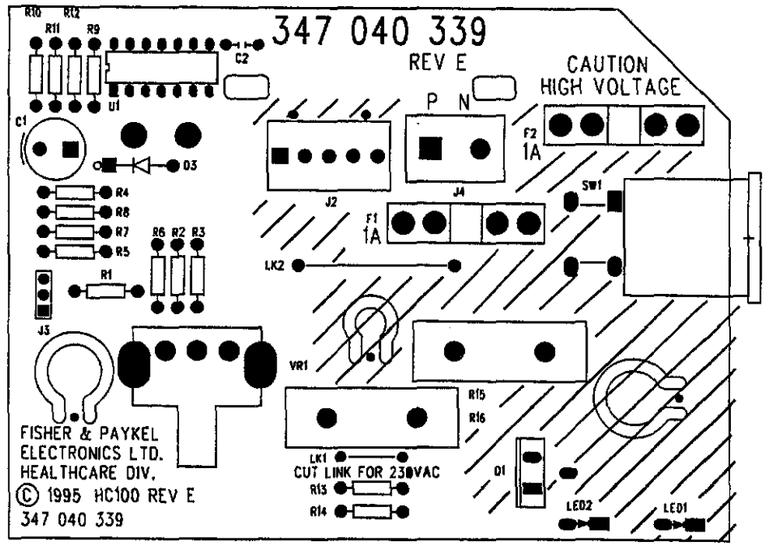
The type of thermistor used on the HC100 varies depending on the age of the unit. Older Rev F and earlier units used the 095428156 thermistor in conjunction with a 560R resistor in location R6. The later Rev G PCB units use the 095428291 thermistor with a 680R resistor in location R6.

4.5 HC100 COMPONENT LAYOUT

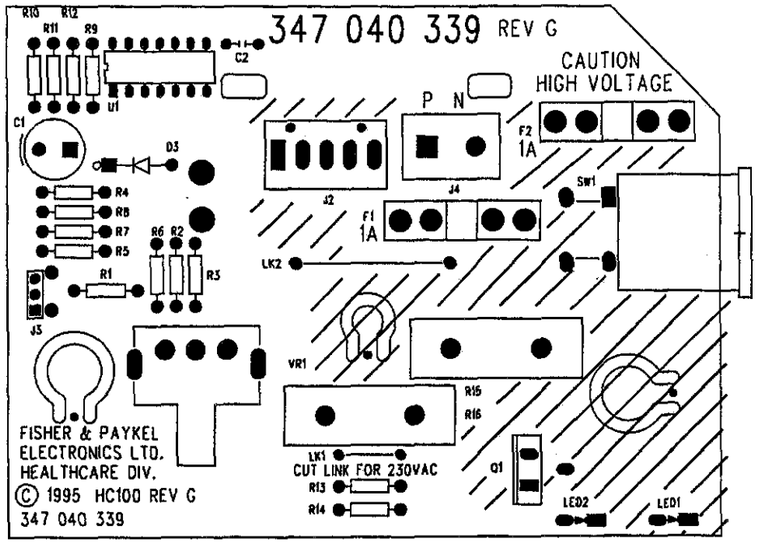
Revision D and earlier (Revision C shown)



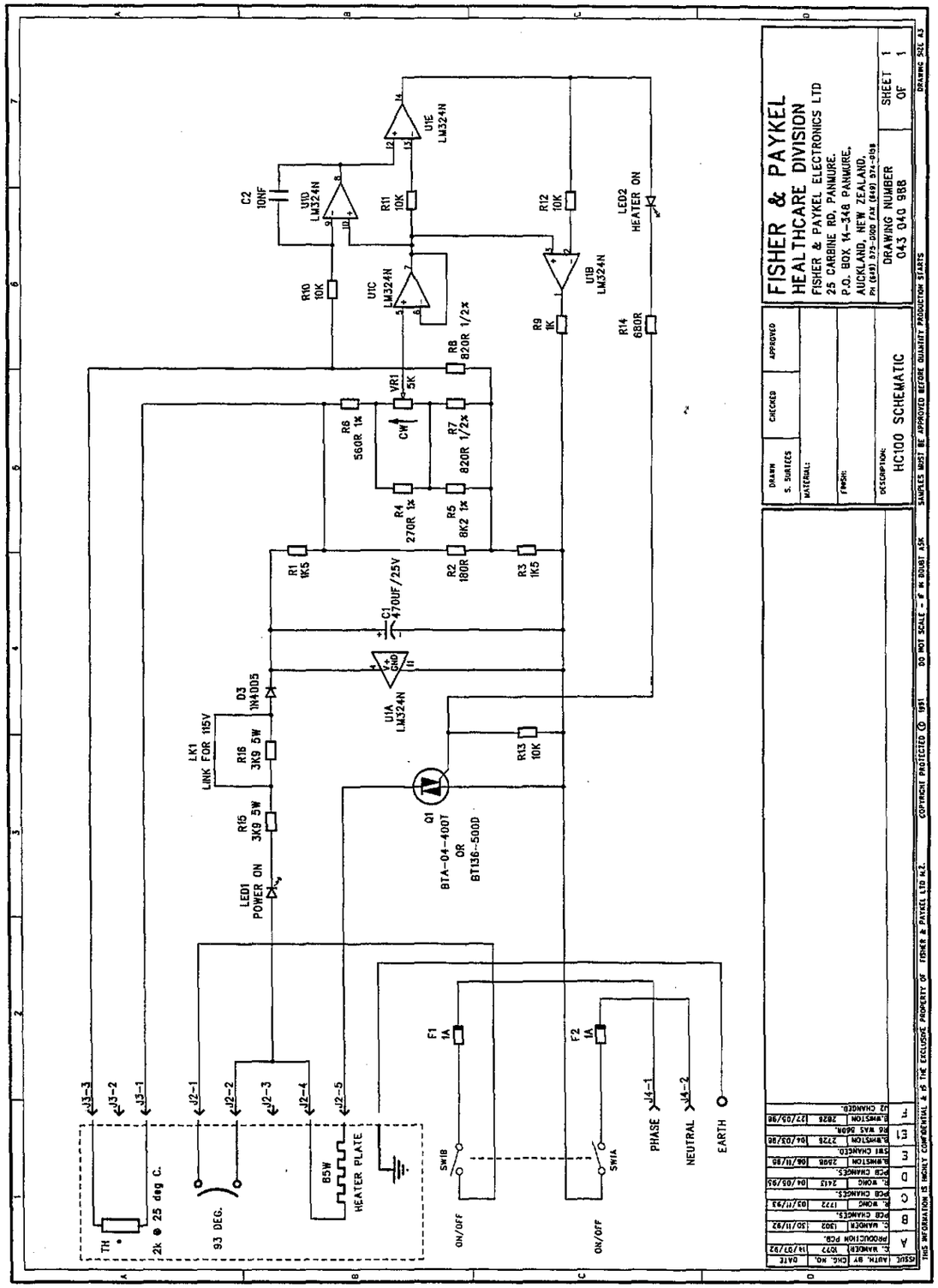
Revision E



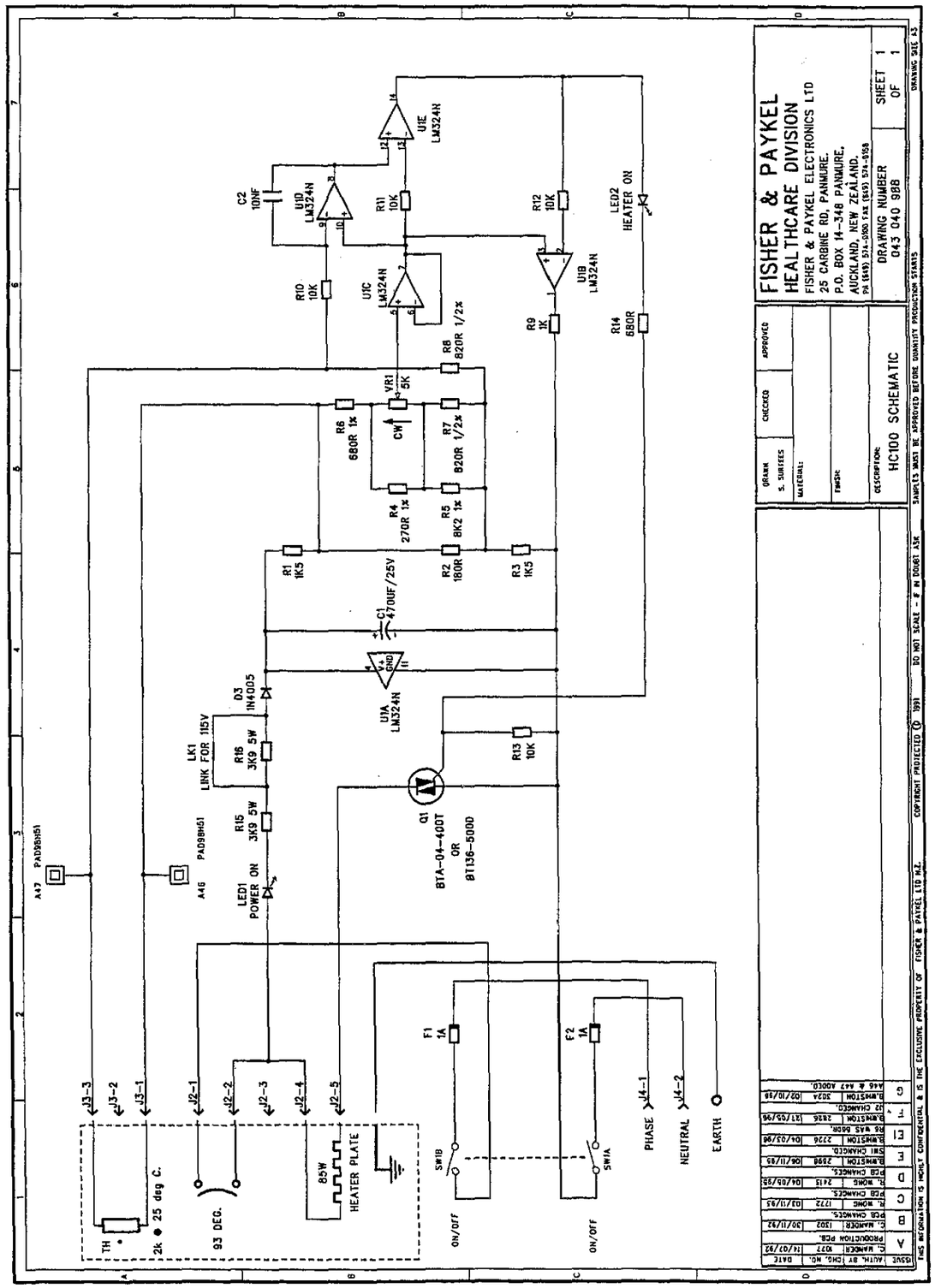
Revision G



4.6 HC100 Circuit Diagram (Rev F and earlier)



4.7 HC100 Circuit Diagram (Rev G)



4.8 Electrical Parts

The electrical components listed below have been referenced according to the HC100 Component Layout diagram (refer §4.5) and HC100 Circuit Diagram (refer §4.6 & §4.7).

Ref.	Part No.	Description
	043040686	HC100 PCB Assembly (rev D and earlier)
	043040988	HC100 PCB Assembly (rev E and later).
F1, F2	999830001	Fuse (20 × 5 mm) 1 A.
J2	341040403	Lock Header 5-way (Rev E & earlier)
J2	341040532	Lock Header 5-way (Rev G & later)
J3	999800059	Lock Wafer 3-way (Rev E & earlier)
J4	999800039	Terminal Block 2-way
LED1, LED2	361040329	LED green
Q1	999550009	Triac 4 A 5 mA Trigger
U1	999600002	IC Quad Op Amp LM324
R1, R3	325040299	Resistor 1k5 0.25 W 5%
R2	325040309	Resistor 180R 0.25 W 5%
R4	325040632	Resistor 270R 0.25 W 1%
R5	325040352	Resistor 8k2 0.25 W 1%
R6	325040135	Resistor 560R 0.25 W 0.5% Metal Film (Rev F & earlier)
R6	325040459	Resistor 680R 0.25 W 0.5% Metal Film (Rev G)
R7, R8	325040136	Resistor 820R 0.25 W 0.5% Metal Film
R9	325040281	Resistor 1k 0.25 W 5%
R10, R11, R12, R13	325040284	Resistor 10k 0.25 W 5%
R14	325040280	Resistor 680R 0.25 W 5%
R15, R16	325040041	Resistor 3k9 5 W
SW1Switch DPDT	349040102	Switch Toggle (Rev D & earlier)
SW1	349040129	Switch Rocker (Rev E & later PCB)
TH	095428156	Thermistor and harness assembly. (Rev F & earlier)
TH	095428291	Thermistor and harness assembly. (Rev G)
VR1	327041564	5k Potentiometer
85 W	043040898	Element assembly 100 V
	043040897	Element assembly 115 V
	043040896	Element assembly 230 V
93 °C	349040051	Thermostat manual reset
	999840001	Clip holder 5mm diameter

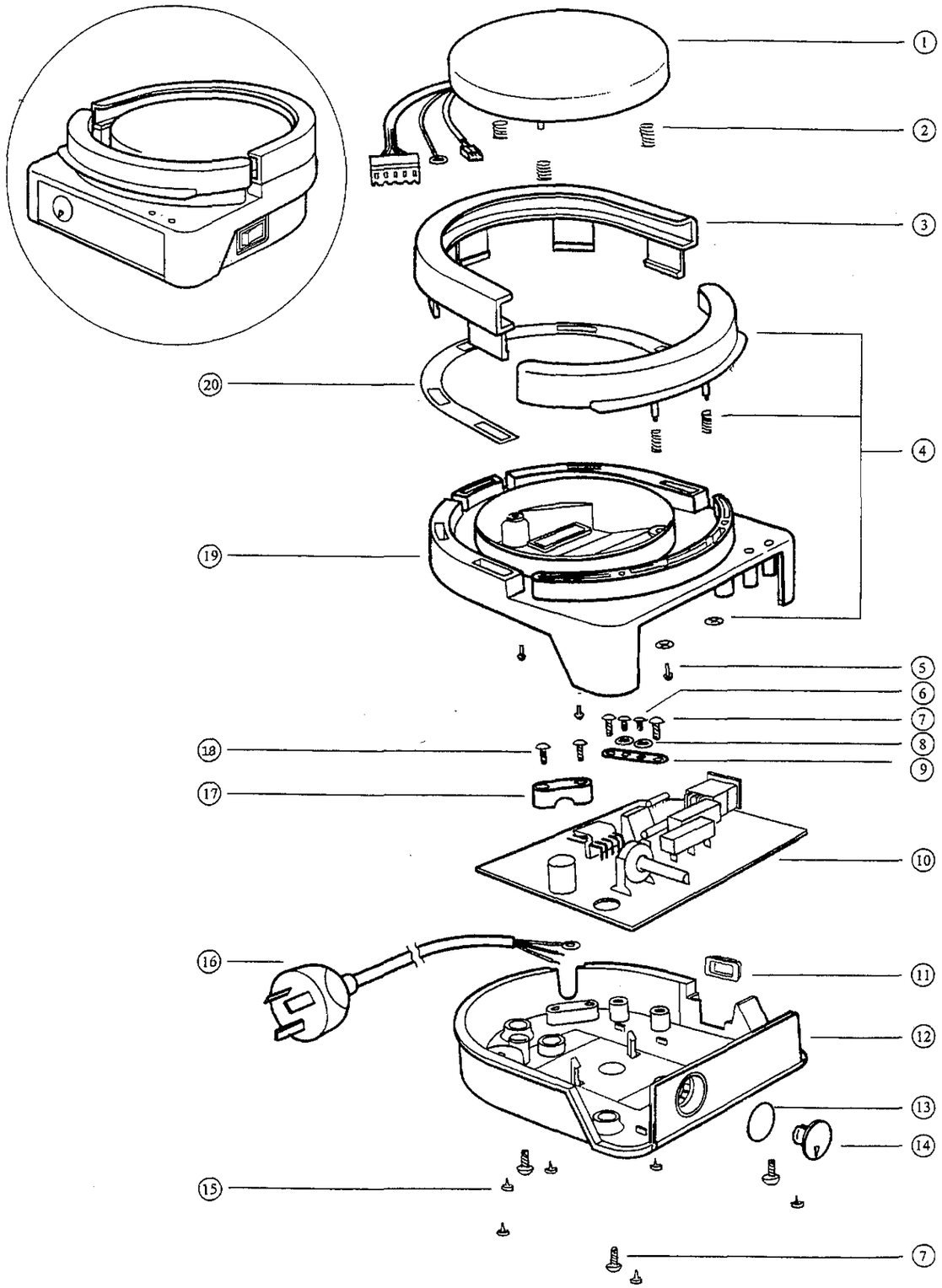
4.9 MECHANICAL PARTS

Reference to the HC100 exploded diagram in §4.8.1 and §4.8.2.

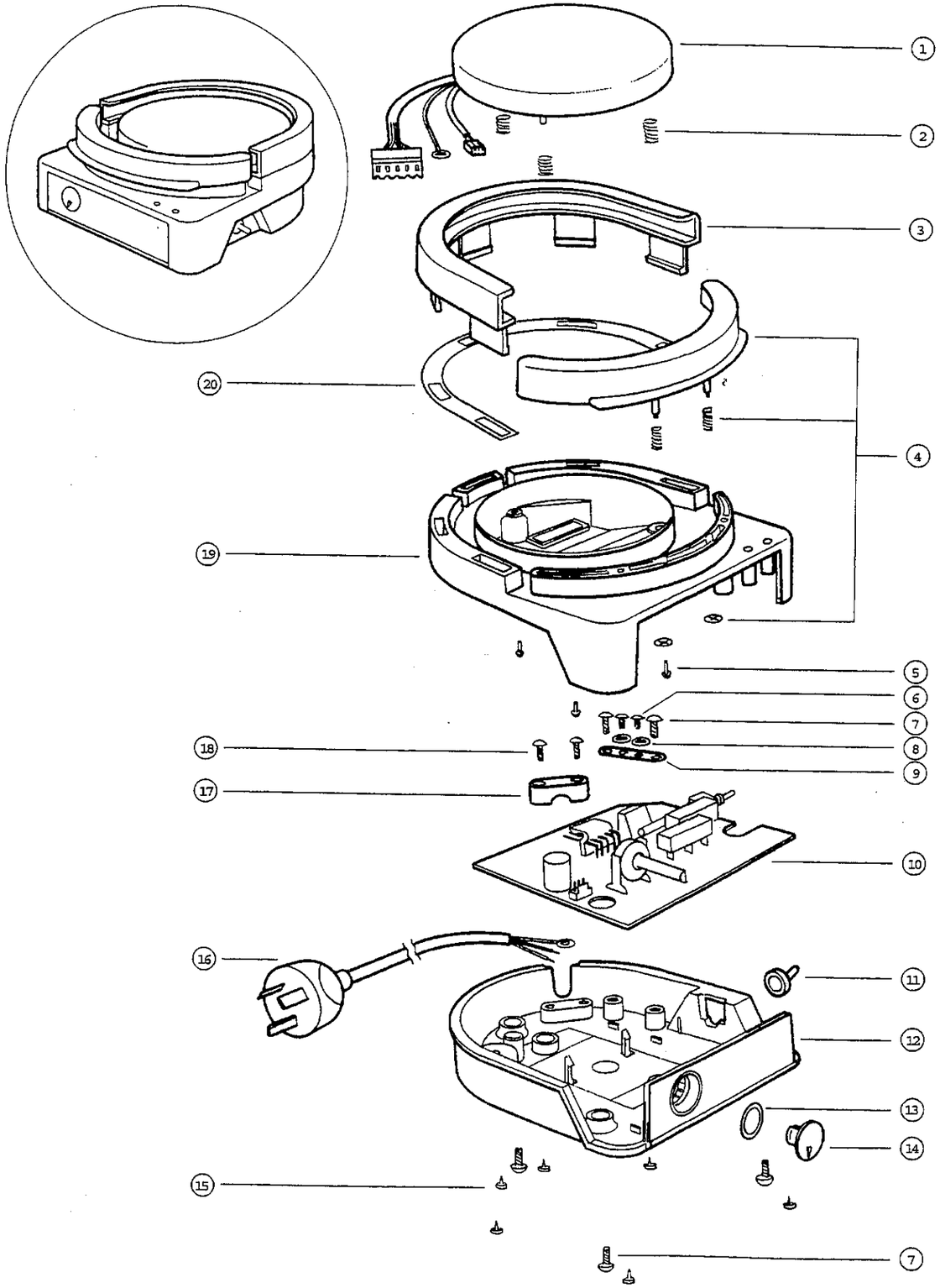
Unless otherwise stated, the reference numbers are valid for both diagrams.

Ref.	Part No.	Description
1	043040939	Heaterplate Assembly 85 W 100 V
	043040940	Heaterplate Assembly 85 W 115 V
	043040941	Heaterplate Assembly 85 W 230 V
2	662040040	Spring Mounting (Standoff Heaterplate)
	662040058	Spring Heaterplate non-standoff
3	043040829	Chamber Clamp
	043040855	Chamber Clamp HC100 Charcoal Kit
4	043040709	Guard Chamber Kit
	043040851	Guard Chamber Kit Charcoal
5	614040116	Screw M3 × 5 Pan Phil Taptite (Standoff Heaterplate)
	336060143	Standoff Heaterplate post fit (Non-Standoff Heaterplate)
6	614040117	Screw M4 × 8 Pan Phil Taptite
7	614040120	Screw #8 × 1/2 Pan Phil TY25 S/S
8	622040130	Washer Lock M4
9	641040723	Plate Earth HC100
10	043040686	PCB Assembly HC100 (Rev D & earlier PCB)
10	043040988	PCB Assembly HC100 (Rev E & later PCB)
11	281151303	Boot Switch Toggle AT-428 (Rev D & earlier PCB)
11	349040130	Boot Switch Rocker (Rev E & later PCB)
12	Specify full serial number	Case Lower HC100
13	336060128	O-Ring HC100 13 mm ID
14	693040554	Knob Control HC100 Grey
	693040634	Knob Control HC100 Charcoal
15	693040517	Foot HC100
16	095428189	Mains Cord 2.0 m HC100 7.5 A 240 V Grey (no plug)
	095428190	Mains Cord 2.0 m HC100 Clr Plug 7.5 A NZ/Aust
	095428193	Mains Cord 2.4 m 3C USA Domestic Plug Grey
	095428218	Mains Cord 2.0 m Schuko Plug 3C White
	095428225	Mains Cord 2.4 m USA Hospital Grade Plug Grey
	095428245	Mains Cord 2.4m USA Hospital Grade Plug Black
	095428246	Mains Cord 2.4 m 3C USA Domestic Plug Black
	095428247	Mains Cord 2.0 m Schuko Plug 3C Black
	095428251	Mains Cord 2.0 m 3C UK (BS1363) Fused White 1.0 mm^2
17	693040476	Clamp Cord Small
	693040477	Clamp Cord Large
18	614040220	Screw #6 × 3/8 Pozi TY25 Zn/St
19	Specify full serial number	Case Upper HC100
20	336060126	Gasket Clamp MR700/HC100

4.9.1 HC100 EXPLODED DIAGRAM (REV E PCB AND LATER)



4.9.2 HC100 Exploded Diagram (Rev D PCB and earlier)

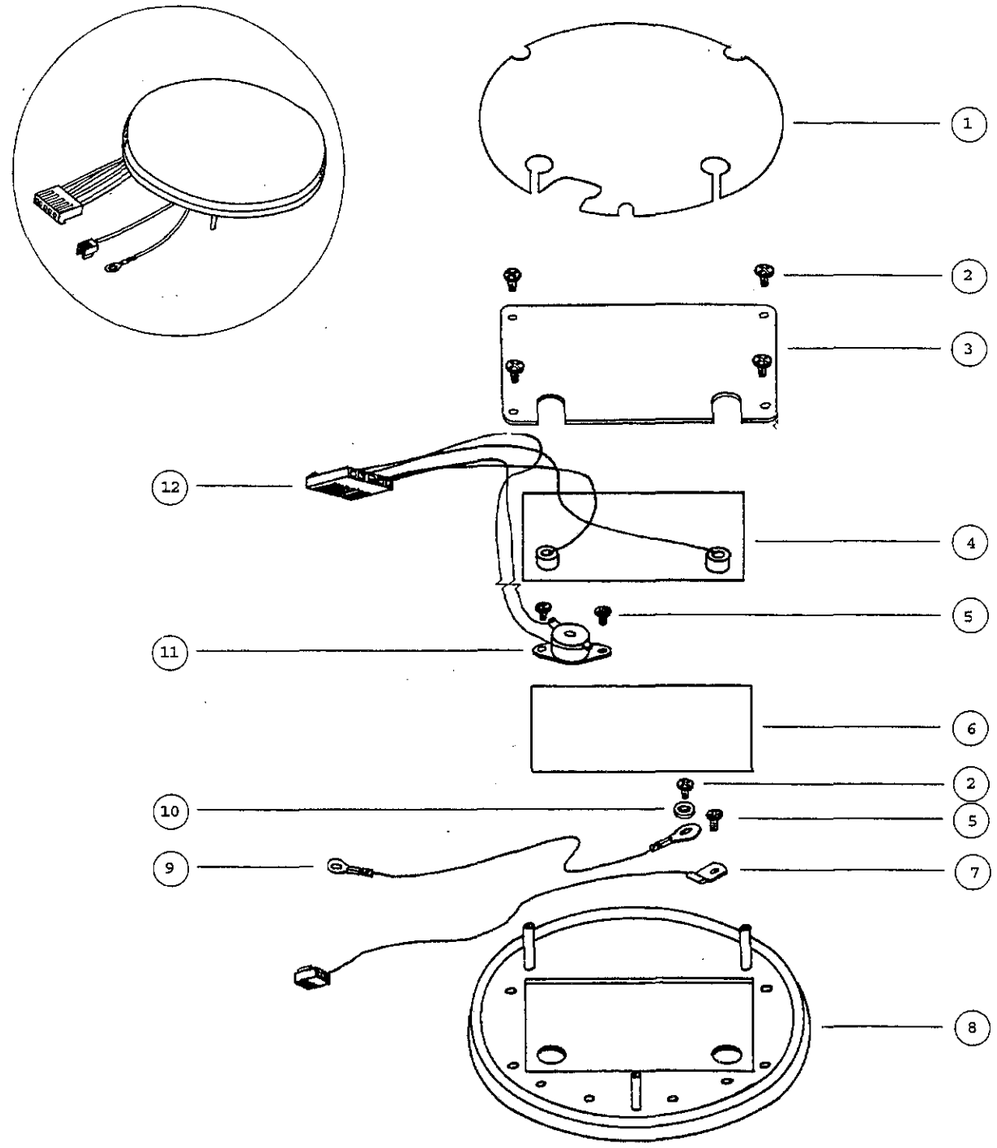


4.10 HEATERPLATE ASSEMBLY PARTS

Reference to the heaterplate exploded diagram in §4.9.1.

Ref.	Part No.	Description
1	331040154	Insulator Heaterplate
2	614040117	Screw M4 × 8 Pan Phil Taptite
3	641040707	Cover Element Plate
4	043040898	Element Assembly 100 V 85 W
	043040897	Element Assembly 115 V 85 W
	043040896	Element Assembly 230 V 85 W
5	614040116	Screw M3 × 5 Taptite Pan Phil YChr
6	331040114	Insulator Element
7	095428156	Thermistor and Harness Assembly (Rev F and earlier)
	095428291	Thermistor and Harness Assembly (Rev G)
8	043040942	Heaterplate
9	095428303	Harness Heaterplate - Earth
10	622040130	Washer Lock M4 Int Zn/Pl
11	349040051	Thermostat 93 °C
12	095428279	Harness J7 - Heaterplate

4.10.1 HC100 HEATERPLATE ASSEMBLY EXPLODED DIAGRAM (INVERTED VIEW)



5.0 PRODUCT CHANGE HISTORY

This change history details changes which may have significance for servicing. Refer also to change panel on circuit diagrams, §4.6 & §4.7. (The serial number format is explained in appendix A).

Date	Change Number	First serial number affected	Comments
11 MAY 1995	2413	9510XXX13451	Introduce rev D PCB.
1 MAY 1996	2598	9610XXX06459	Introduce rev. E PCB. Change mains switch to rocker type. Change PCB to Phenolic
9-DEC-1996	3041	9610XXX20412	Introduce Rev G PCB. Change to 2 kΩ. at 25 °C thermistor. Change value of R6 from 560 Ω to 680 Ω. Alter J3 to a solder connection.
21-MAY 1997	3301	9710XXX28456	Revised heaterplate with no standoffs
2-SEP-1998	3816	9810XXX32690	Use machined anodised heaterplate, 655040111 in production.

APPENDIX A PRODUCT NUMBERS

This section explains how the part number is deciphered. The model number refers to a specific variant while the serial number individually identifies the manufactured item. The model number and serial number collectively form the product number.

A1 MODEL NUMBER EXPLANATION

e.g. for HC100AHU:

HC100	A (first letter)	H (second letter)	U (third letter)
Model Type	Voltage	Language	Customer Specific

The first and second letters represent the following:

First Letter	Voltage	Second Letter	Front Panel Language	Side Panels Language
A	230 ± 20 V	D	English	English/German
J	115 V	E	English	English/French
G	100 ± 10 V	F	French	English/French
		G	German	English/German
		H	English	English/Spanish
		J	Japanese	English/Japanese
		L	Italian	English/Italian
		S	Spanish	English/Spanish

A2 SERIAL NUMBER EXPLANATION

e.g. for 9610AHU03789:

Year	Model Number Abbreviation	Code	Serial Number
96	10	AHU	03789

The three-letter code (e.g. AHU) is defined above.